

### Homework Review for Supplement 1-9:

The vast majority of the homework so far can be broken up into 3 types of questions

1. Draw a line and find the slope
2. Given a slope draw a reference line and slide your ruler
3. Appropriately read a value off a graph.

We also did some notation, terminology and reading increment graphs, but for this review I want to focus on the questions where we are given an overall value graph (distance, water out of a reservoir, cars out of a lot, stock price, TR, TC, VC, etc...) and asked to do one of the 3 questions above.

Over the last several days, I have gone through all the homework and organized the questions by topic. I hope you can use this to help you improve your understanding of the terminology of the course and to help you identify what to do on a given problem.

### Question Type 1: Draw a secant, extend it out, read off two points and find slope:

*Overall - A secant that goes through the y-intercept of the graph (i.e. from the beginning of the graph):*

Supp 1-3 / 1(f) Compute the car's **average trip speed at  $t = 40$** .

Supp 1-3 / 3(a) compute the **average trip speed at  $t=25$  min.**

Supp 1-3 / 3(b) What is the **lowest value of average trip speed?**

Supp 1-3 / 3(e) What are lowest and highest values of Car A's **average trip speed?**

Supp 4 / 2(a) What is the **overall rate of usage at 5 am?**

Supp 4 / 4(d) Find the **overall average rate of flow into** the parking lot over the first **7** hours.

Supp 5 / 1(d) Compute the **overall rate of flow** at 5 am.

Supp 5 / 2(b) Compute the **overall rate of change** in the TG at  $t = 6$ .

Supp 8-9 / 1(a) Compute the **average variable cost** at 50 Blivets.

Supp 8-9 / 1(c) Compute the **average revenue** at 80 Blivets.

Supp 8-9 / 2(b) Compute **average variable cost** at 3 thousand items.

*Diagonal Slope (from the origin):*

Supp 5 / 4(a) Compute  **$f(7) / 7$**

Supp. 8-9 / 1(b) Compute **average cost** to produce 50 Blivets.

Supp 8-9 / 2(b) Compute **average cost** to produce 3 thousand items.

*Over an interval:*

Supp 1-3 / 1(d) Find the car's **average speed from  $t = 40$  to  $t = 45$** .

Supp 1-3 / 3(c) compute the **average speed during the 5-minute interval beginning at  $t=25$  minutes.**

Supp 1-3 / 3(d) compute the **average speed during the 2.5-minute interval ending at  $t=10$  minutes**

Supp 4 / 4(e) What is the **incremental rate of flow out** of the lot during the three-hour period ending at  $t=6$  hours?

Supp 5 / 1(e) Compute the **slope of the secant line** from  $t = 2$  to  $t = 8$ .

Supp 5 / 4(b) Compute  **$(f(18) - f(10)) / 8$** .

*A secant that looks like a tangent (make the line just touch at the given time):*

Supp 5 / 1(c) Compute  **$(TG(1.1) - TG(1))/0.1$**

Supp 5 / 2(g) Is the **slope from 1 to 1.1** bigger than 5? Is the slope from 3 to 3.1 bigger than 5? ...

Supp 6-7 / 1(f) Compute the **Marginal Revenue** and **Marginal Cost**.

Supp 6-7 / 2(e) Estimate the **marginal cost at 24 hundred Blinkos**.

Supp 6-7 / 3(b) Compute the **marginal revenue at 3 thousand items**.

**Question Type 2: Given a slope, draw a reference line and slide ruler parallel:**

*Searching for an overall rate (slide ruler parallel up to y-intercept and find the intersection):*

Supp 1-3 / 3(a) Find a time at which Car A's **average trip speed is 0.84 mpm.**

Supp 1-3 / 3(f) A second car, Car B, is next to Car A at  $t=0$  and **travels at a constant speed of 0.9 mpm.**

Draw the distance graph for Car B.

Supp 4 / 2(b) Name the earliest time at which the **overall rate of usage is 150 gallons per hour.**

Supp 5 / 2(e) Find when TG has an **overall rate of 5.**

Supp 5 / 4(c) Find a value of  $x$  such that  $(f(x) - f(0))/x = 0.3$

Supp 8-9 / 2(g) Find a quantity at which **average variable cost is \$8 per item.**

*Searching for a diagonal line intersection:*

Supp 8-9 / 2(f) Find a quantity at which **average cost is \$8 per item.**

*Searching for an interval (slide ruler parallel up to a secant that has the desired interval length):*

Supp 1-3 / 3(b) Find two **ten-minute intervals** during which the **average speed of Car A is 0.2 mpm.**

Supp 1-3 / 3(c) **Find an interval that begins at  $t=50$**  during which Car A's **average speed is 0.6 mpm.**

Where does that interval **end?**

Supp 4 / 2(c) Water flows into the reservoir at a **constant rate of 100 gallons per hour.** During how many **one-hour intervals is water flowing out at the same rate** it is flowing in?

Supp 5 / 2(d) Find a **one-month interval** when TG has an **incremental rate of 5.**

*Searching for a very small interval (i.e. searching for a tangent line):*

Supp 8-9 / 2(h) Find where **marginal cost is less than \$2.50 per item.**

*Given a slope to draw a straight line graph for some function:*

Supp 6-7 / 2(f) The price is \$2 per item (so you can **draw TR**)

Supp 8-9 / 2(h) The price is \$10 per item (so you can **draw TR**)

*Largest Vertical Gap Question (Match Slopes!)*

Supp 1-3 / 3(g) Find the time at which **Car A is ahead of Car B by the largest distance.**

Supp 4 / 2(e) if water flows in at a constant rate of 100 gallons per hour, what is the smallest amount of water needed in the reservoir so that the town gets all the water it needs during this 24-hour period?

(Note: Looking for the **largest shortage**).

Supp 5 / 2(h) Find the time at which the **TG graph exceeds the ST graph by the largest amount.**

Supp 6-7 / 2(g) At what **quantity is marginal revenue equal to marginal cost.**

Supp 6-7 / 3(f) Determine the **maximum possible profit.**

Supp 8-9 / 1(e)(f) Find the quantity that will **maximize your profit.**

Supp 8-9 / 2(j) What quantity **maximizes profit?**

### Question Type 3: Reading off values:

#### *Finding x or y values:*

- Supp 1-3 / 1(a) **How far** does the car travel in the first 30 minutes?  
Supp 4 / 4(a) **How many cars** are in the lot at  $t=5$  hours?  
Supp 1-3 / 1(b) **Find a time** at which the car has traveled approximately 19 miles.  
Supp 4 / 4(b) **Name the first time** after  $t=0$  when there are exactly 1275 cars in the lot again.  
Supp 6-7 / 1(b) **What is total revenue** at 25 thousand Robots.  
Supp 6-7 / 1(c) How much do you spend on **fixed costs**?  
Supp 6-7 / 1(d) **What is your total cost** if you produce 50 thousand Robots?  
Supp 6-7 / 1(g) **At what quantity do you break even** (i.e. when is profit zero).  
Supp 6-7 / 2(a) What is the **value of your fixed costs**?  
Supp 6-7 / 2(b) Approximate the **Total Cost and Variable Cost** at 8 hundred Blinkos.  
Supp 6-7 / 2(c) **Find a quantity at which total cost** is 45 hundred dollars.  
Supp 6-7 / 2(d) **Find a quantity at which variable cost** is \$2000.  
Supp 6-7 / 3(d) Give the longest interval on which **total revenue is at least \$8,000**.  
Supp 6-7 / 3(e) What is the **largest value of total revenue**?

#### *Find change in height (difference between two y-values):*

- Supp 1-3 / 1(c) **How far** does the car travel from time 40 minutes to time 60 minutes?  
Supp 5 / 1(c) Compute the value  $A(10) - A(3)$ .  
Supp 5 / 2(a) Compute  $TG(3) - TG(1)$ .  
Supp 5 / 4(d) Find a value of  $x$  such that  $f(x) - f(15) = 2$ .  
Supp 5 / 4(e) Find a value of  $x$  such that  $f(x) - f(22) = 0$ .  
Supp 6-7 / 3(c) **How much does revenue increase** from 5000 to 15000 items.

#### *Vertical Gap Between Two graphs:*

- Supp 6-7 / 1(e) **Approximate the profit** if you produce and sell 80,000 Robots.

#### *Interval for change in height (note: Instead of guess and check, you can also turn these into slope questions by dividing rise over run and then using reference line techniques):*

- Supp 1-3 / 3(d) **Find a five-minute interval** in the first thirty minutes during which Car A **travels 4 miles**.  
When does this interval **end**? (Note: This is the same as a slope of  $4/5 = 0.8$  mile/minute).  
Supp 1-3 / 4(f) Find a **two-hour interval**, beginning after  $t=6$ , during which 500 cars entered the lot.  
(Note: This is the same as a slope of  $500/2 = 250$  cars/hour)